Measuring Progression of Parkinson's Disease Using Wearables and Sensors

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Parkinson's Disease (PD) affects 7-10 million people globally. Usual observable symptoms of PD include stiffness, slowness, tremor, gait change and speech distortion. Currently, there is no objective way for day-to-day tracking of symptoms and progression of PD. Dosage planning is done based on the narrated experience of the patient making it slightly unscientific. Hence, a setup consisting of wearable devices, sensor, controller and cloud database to track and profile the symptoms has been developed. JStiffness-3D measures stiffness and slowness of the body. JGait-3D measures gait changes over time. JTremor-3D tracks and profiles tremors of the patients. JSpeech is specially designed and developed to measure the speech distortion among patients who have undergone Deep-Brain-Stimulation surgery. An objective measure called PDProgression Index (PDPI) provides a quantitative measure of the progression of PD based on the captured symptoms. The overall setup is based on three themes, viz. Ease and affordability, On demand real-time accessibility, and quantifiable measurements. Measurements are done with respect to the body, hence can distinguish voluntary movements from involuntary. Normalized PDPI has been validated using Parkinson’s Disease’s UPDMS-based dataset of 5600+ patients and found that it matches well with the overall PD levels in this dataset for mid and advanced cases. This can assist the doctors during dosage planning, physio-therapy planning and caregivers during retuning of brain pacemaker of DBS-surgery patients. Possible uses also include digital biomarker for PD trials and eventual integration with DBS pacemaker for its autotuning. Large data generated by devices can be used for classification and prediction.

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